

INCEFA-SCALE Project – Data Mining and Lessons Learning

Authors:

Roman Cicero (Inesco Ingenieros, Santander, Spain), Alec McLennan (Jacobs, Warrington, UK), Jonathan Mann (Jacobs, Warrington, UK), Jack Beswick (Jacobs, Warrington, UK), Luc Doremus (Framatome, Le Creusot, France), Sam Cuvilliez (EDF, Lyon, France)

Proceedings of the ASME 2023 Pressure Vessels & Piping Conference (PVP2023)

July 16-21, 2023, Atlanta, Georgia, USA

Paper No.: **PVP2023-106618**; 8 pages

DOI: 10.1115/PVP2023-106618

Published Online: October, 2023 (*expected*)

URL: <https://asmedigitalcollection.asme.org/>

Abstract:

INCEFA-SCALE is a five-year project supported by the European Commission HORIZON2020 program. It is the successor to the INCEFA-PLUS project that ran from 2015 to 2020. Both projects try to address existing gaps between the fatigue behavior of stainless steels in the laboratory, real fatigue behavior observed in nuclear components during operating service, and provide guidance on how to account for the studied behavior in fatigue assessments.

These programmes are contributing to a database with a large number of parameters (strain amplitude, strain rate, temperature, surface roughness, hold time periods, chemistry, etc.). Once the International Fatigue Database Agreement is signed, this database will be augmented with fatigue data shared by international organisations from the US, Korea, Japan and Europe. This will enable INCEFA-SCALE to investigate one of the largest fatigue databases in the world. However, a database compiled from a range of sources with differing objectives creates an issue for analysts as the data will not necessarily be balanced. The impact that this issue may have on an analysis can be mitigated through good data screening and selection practice that must be informed by data visualization. One of the objectives of the INCEFA-SCALE data mining workpackage is to develop and provide a set of tools to aid in this mitigation as well as enabling the statistical analysis of the broader dataset.

During the INCEFA-SCALE project, a data mining tool was developed to statistically analyze all data available to date. In this paper, these tools are presented and, as a proof of concept, used to analyse the available using similar concepts to that of INCEFA-PLUS. To aid in the evaluation of the database and tools expressions for predicting fatigue life of stainless steel specimens in air and high water reactor primary coolant conditions are provided. A key requirement of these data exploration and analysis tools is that they are generally accessible and available to the INCEFA-SCALE community to support collaborative data analysis.. The conclusions and findings extracted from this data mining analysis are shown and compared with the current procedures most used in environmental fatigue analyses of nuclear components and systems.

Keywords: environmentally assisted fatigue, pressurized water reactor, databases, data mining, predictors



This project has received funding from the Euratom Research & Training programme 2019-2020 under grant agreement N° 945300